

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF AERONAUTICS -- STANDARD SPECIFICATION
P-208
Aggregate Base Course

DESCRIPTION

1.1 This item shall consist of a base course composed of crushed, partially crushed, or uncrushed coarse aggregate or both. It shall be constructed on a prepared underlying course in accordance with these specifications and shall conform to the dimensions and typical cross section shown on the plans and with the lines and grades established by the Engineer.

MATERIALS

2.1 Uncrushed Course Aggregate. The base course material shall consist of hard, durable particles or fragments of stone or gravel mixed or blended with sand, stone dust, or other similar binding or filler materials produced from approved sources. All oversized stones, rocks, and boulders occurring in the pit or quarry material shall be wasted; those of acceptable quality may be crushed and become a part of the base material, provided the blend meets the specified gradations. The aggregate shall be free from vegetation, lumps, or excessive amounts of clay and other objectionable substances. The coarse aggregate shall have a percent of wear not more than 45 at 500 revolutions as determined by AASHO T 96 (Los Angeles Rattler Test).

2.2 Crushed Coarse Aggregate. The aggregates shall consist of both fine and coarse fragments of crushed stone, crushed slag, or crushed gravel mixed or blended with sand, screenings, or other similar approved materials. The crushed stone shall consist of hard, durable particles or fragments of stone and shall be free from excess flat, elongated, soft or disintegrated pieces, dirt, or other objectionable matter.

The crushed slag shall be air-cooled, blast furnace slag and shall consist of angular fragments reasonably uniform in density and quality and shall be reasonably free from thin elongated, or soft pieces, dirt, and other objectionable matter. It shall weigh not less than 70 pounds per cubic foot as determined by AASHO T 19.

The crushed gravel shall consist of hard durable stones,

rock and boulders crushed to specified size and shall be free from excess flat, elongated, soft or disintegrated pieces, dirt or other objectionable matter. The method used in production of crushed gravel shall be such that the fractured particles occurring in the finished product shall be as nearly constant and uniform as practicable and shall result in at least the **specified percentage** of material retained on a No. 4 mesh sieve having one or more fractured faces.

If necessary to meet this requirement or to eliminate an excess of fine, uncrushed particles, the gravel shall be screened before crushing. All stones, rocks, and boulders of inferior quality in the pit shall be wasted.

The crushed coarse aggregate shall have a percent of wear not more than 50 at 500 revolutions as determined by AASHO T 96.

All material passing the No. 4 mesh sieve produced in the crushing operation of either stone, slag, or gravel shall be incorporated in the base material to the extent permitted by the gradation requirements.

2.3 Gradation. The gradation of the uncrushed or crushed material shall meet the requirements of one of the gradations given in the following table when tested in accordance with AASHO T 11 and T 27.

TABLE 1. REQUIREMENTS FOR GRADATION OF
AGGREGATE

Sieve designation (square openings)	Percentage by weight passing sieves		
	A 2" maximum	B 1 ½" maximum	C 1" maximum
2 inch	100	-----	-----
1 ½ inch	-----	100	-----
1 inch	55-85	70-95	100
¾ inch	50-80	55-85	70-100
No. 4	30-60	30-60	35-65
No. 40	10-30	10-30	15-30
No. 200	5-8	5-8	5-8

The gradations in the table represent the limits which shall determine suitability of aggregate for use from the sources of supply. The final gradations decided on within the limits designated in the table shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit of the adjacent sieves, or vice versa.

The amount of the fraction of the filler and binder, including any blended material, passing the No. 40 mesh sieve shall have a liquid limit not more than 25 and a plasticity index not more than 6 when tested in accordance with AASHTO T 89 and T 90.

The selection of any of the gradations shown in the table shall be such that the maximum size aggregate used in any course shall be not more than two-thirds the thickness of the layer of the course being constructed.

2.4 Filler for Blending. If filler, in addition to that naturally present in the base course material, is necessary for satisfactory bonding of the material, for changing the soil constants of the material passing the No. 40 mesh sieve, or for correcting the gradation to the limitations of the specified gradation, it shall be uniformly blended with the base course material at the crushing plant or at the mixing plant. The material for such purpose shall be obtained from sources approved by the Engineer and shall be of a gradation necessary to accomplish the specified gradation in the finally processed material.

The additional filler may be composed of sand, but the amount of sand shall not exceed 20% by weight of the total combined base aggregate. All the sand shall pass a No. 4 mesh sieve and not more than 5% by weight shall pass a No. 200 mesh sieve.

When specified on the plans, the maximum amount of material finer than 0.02 mm in diameter shall be less than 3%.

CONSTRUCTION METHOD

3.1 Operations in Pits and Quarries. All work involved in clearing and stripping pits and quarries, including handling of unsuitable material, shall be performed by the Contractor. All material shall be handled in a manner that shall secure a uniform and satisfactory base product. The base course material shall be obtained from sources that have been approved.

3.2 Equipment. All equipment necessary for the proper construction of this work shall be on the project, in first-class working condition, and approved by the Engineer before construction is permitted to start.

3.3 Preparing Underlying Course. The underlying course shall be checked and accepted by the Engineer before placing and spreading operations are started. Any ruts or soft, yielding places due to improper drainage conditions, hauling, or any other cause, shall be corrected and rolled to the required density before the base course is placed thereon.

Grade control between the edges of the pavement shall be accomplished by grade stakes, steel pins, or forms placed in lanes parallel to the centerline of the pavement at intervals sufficiently close that string lines or check boards may be placed between stakes, pins or forms.

To protect the underlying course and to insure proper drainage, the spreading of the base shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope.

3.4 Methods of Production.

(a) **Plant Mix.** When provided in the proposal, or when selected by the Contractor and approved by the Engineer, the base material shall be uniformly blended or mixed in any approved plant. The mixing plant shall include bins for storage and batching of the aggregate, pump and tanks for water, and batch mixers of either the pugmill or drum type. All mineral aggregates shall be batched into the mixer by weight. The agitation shall be such that a thorough dispersion of moisture is obtained. The size of the batch and the time of mixing shall be fixed by the Engineer and shall produce the results and requirements specified. The base course material produced by combining two or more materials from different sources shall be mixed in a mixing plant described herein. The mixture material shall be at a satisfactory moisture content to obtain maximum density.

The base material shall be stockpiled, either at the plant or on the work site, prior to placing and spreading on the prepared underlying course.

(b) **Materials of Proper Gradation.** When the entire base course material from coarse to fine is

secured in a uniform and well-graded condition and contains approximately the proper moisture, such approved material may be handled directly to the spreading equipment. The material may be obtained from gravel pits, stockpiles, or produced from a crushing and screening plant with the proper blending. The materials from these sources shall meet the requirements for gradation, quality, and consistency. The intent of this section of these specifications is to secure materials that will not require further mixing. The base material shall be at a satisfactory moisture content to obtain maximum density. Any minor deficiency or excess of moisture may be corrected by surface sprinkling or by aeration. In such instances some mixing or manipulation may be required immediately preceding the rolling to obtain the required moisture content. The final operation shall be blading or dragging, if necessary, to obtain a smooth uniform surface true to line and grade.

The base material shall be stockpiled, either at the plant or on the worksite, prior to placing and spreading on the prepared underlying course.

3.5 Methods of Spreading.

(a) The aggregate base material that is correctly proportioned, or has been processed in a plant, shall be placed on the prepared underlying course and compacted in layers of the thickness shown on the plans. The depositing and spreading of the material shall commence where designated and shall progress continuously without breaks. The material shall be deposited and spread in lanes in a uniform layer and without segregation of the size to such loose depth that, when compacted, the layer shall have the required thickness. The base aggregate shall be spread by spreader boxes or other approved devices having positive thickness controls that shall spread the aggregate in the required amount to avoid or minimize the need for hand manipulation. Dumping from vehicles in piles which require rehandling shall not be permitted. Hauling over the uncompacted base course shall not be permitted.

(b) The aggregate base material that has been processed in a traveling plant, or mixed and blended in-place, shall be spread in a uniform layer of required depth and width and to the typical cross-section. The spreading shall be by a self-powered blade grader, mechanical spreader, or other approved method. In

spreading, care shall be taken to prevent cutting into the underlying layer. The material shall be bladed until a smooth, uniform surface is obtained, true to line and grade.

(c) The base course shall be constructed in a layer not less than 2 ½ inches nor more than 4 ½ inches of compacted thickness. The aggregate as spread shall be of uniform grading with no pockets of fine or coarse materials. The aggregate, unless otherwise permitted by the Engineer, shall not be spread more than 2,000 square yards in advance of the rolling. Any necessary sprinkling shall be kept within these limits. No material shall be placed in snow or on a soft, muddy, or frozen course.

When more than one layer is required, the construction procedure described herein shall apply similarly to each layer.

The Engineer shall make tests to determine the maximum density and the proper moisture content of the base material, and this information will be available to the Contractor. The base material shall be at a satisfactory moisture content when rolling is started and any minor variation prior to or during rolling shall be corrected by sprinkling or by aeration if necessary.

During the mixing and spreading process, sufficient caution shall be exercised to prevent the incorporation of subgrade, subbase, or shoulder material in the base course mixture.

3.6 Finishing and Compacting. After spreading, the aggregate shall be thoroughly compacted by rolling. The rolling shall progress gradually from the sides to the center of the lane under construction, or from one side toward previously placed material by lapping uniformly each preceding rear-wheel track by one half the width of such track. Rolling shall continue until the entire area of the course has been rolled by the rear wheels. The rolling shall continue until the aggregate is thoroughly set, the interstices of the material reduced to a minimum, and until creeping of the material ahead of the roller is no longer visible. Rolling shall continue until the base material has been compacted to not less than 100% density as determined by the compaction control tests specified in FAA T 611. Blading and rolling shall be done alternately, as required or directed, to obtain a smooth, even, and uniformly compacted base.

The course shall not be rolled when the underlying course is soft or yielding or when the rolling causes undulation in the base course. When the rolling develops irregularities that exceed 3/8 inch when tested with a 16-foot straightedge, the irregular surface shall be loosened, refilled with the same kind of material as that used in constructing the course, and rolled again as required.

In areas inaccessible to rollers, the base course material shall be tamped thoroughly with mechanical tampers.

The sprinkling during rolling, if necessary, shall be in the amount and by equipment approved by the Engineer.

3.7 Surface Test. After the course has been completely compacted, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified, reshaped, recompact, and otherwise manipulated as the Engineer may direct until the required smoothness and accuracy are obtained. The finished surface shall not vary more than 3/8 inch from a 16-foot straightedge when applied to the surface parallel with, and at right angles to, the centerline.

3.8 Thickness. The thickness of the completed base course material shall be determined by elevations taken to the nearest 0.01 foot, at intervals not exceeding 50 feet, using the method of setting finished grade stakes.

The thickness shall be verified by the Contractor, at his expense, by the taking of cores or depth tests in the presence of the Engineer. Cores or depth tests shall be taken at intervals of not less than one per 3000 square yards of material placed. When deficiencies in excess of 1/2 inch are noted, the Contractor shall make such additional cores or depth tests, as required by the Engineer, to determine the extent of the deficiency.

Replacement and compaction of base material removed for test purposes shall be accomplished by the Contractor, at his expense.

Deficiencies in thickness in excess of 1/2 inch of base material shall be corrected by the Contractor, at his expense, by scarifying, adding satisfactory mixture, rolling, sprinkling, reshaping and finishing in accordance with these specifications.

3.9 Protection. Work on the base course shall not be accomplished during freezing temperatures nor when the subgrade is wet. When the aggregates contain frozen materials or when the underlying course is frozen, the construction shall be stopped.

Hauling equipment may be routed over completed portions of the base course, provided no damage results and provided that such equipment is routed over the full width of the base course to avoid rutting or uneven compaction. However, the Engineer in charge shall have full and specific authority to stop all hauling over completed or partially completed base course when, in his opinion, such hauling is causing damage. Any damage resulting to the base course from routing equipment over the base course shall be repaired by the Contractor at his own expense.

3.10 Maintenance. Following the completion of the base course, the Contractor shall perform all maintenance work necessary to keep the base course in a condition satisfactory for priming. After priming, the surface shall be kept clean and free from foreign material. The base course shall be properly drained at all times. If cleaning is necessary, or if the prime coat becomes disturbed, any work or restitution necessary shall be performed at the expense of the Contractor.

Before preparations begin for the application of a surface treatment or for a surface course, the base course shall be allowed to partially dry until the average moisture content of the full depth of base is less than 80% of the optimum moisture of the base mixture. The drying shall not continue to the extent that the surface of the base becomes dusty with consequent loss of binder. If during the curing period the surface of the base dries too fast, it shall be kept moist by sprinkling until such time as the prime coat is applied as directed.

METHOD OF MEASUREMENT

4.1 The quantity of aggregate base course to be paid for, either crushed or uncrushed as required in the proposal, shall be the number of cubic yards, compacted measure, of base course material placed, bonded, and accepted in the completed base or subbase course. The quantity of base course material shall be measured in final position, based on average and areas of the completed work, computed from elevations to the nearest 0.01 foot. No payment will be made for material placed in excess of the specified depth. Base

materials shall not be included in any other excavation quantities.

BASIS OF PAYMENT

5.1 Payment shall be made at the contract unit price per cubic yard, compacted measurement, for aggregate base course. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under the nomenclature and seven digit item number specified in the plans and proposal for each type of aggregate base course or base course work required per cubic yard or per square yard, as applicable.

The first three digits of any item number for work included under this specification shall be 208, i.e. 208XXXX

TESTING & MATERIAL REQUIREMENT

AASHTO T 96 Abrasion
AASHTO T 11 and T 27 Gradation
AASHTO T 89 Liquid Limit
AASHTO T 90 Plastic Limit and Plasticity Index
FAA T 611 Density
AASHTO T 19 Unit Weight